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12a. DISTRIBUTION/AVAILABILITY STATEMENT

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12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

Work focussed on describing the solar activity cycle's clock as a torsional oscillator, and describing the origin of the 5 minute oscillations, which are used as a seismic probe. It has been discovered that the sun's rotation does not vary near the base of the convection zone but may vary deeper down. The full equations for the torsional oscillator have been developed and have been solved for certain situations. It has been shown that the 5 minute oscillations are driven by granular size explosive events. In observational work, the observing set-up has been designed to capture the whole solar disk. Data is now able to be collected in a production mode. Data reduction programs also are in full operation. The basic behavior of 5 minute oscillations has been clearly seen. A search is underway for the global organization of convection to determine if giant cells exist.

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New Jersey Institute of Technology

Department of Physics

November 15, 1991

Dr. Henry Radoski, Physics Directorate
Air Force Office of Scientific Research
Building 410
Bolling Air Force Base
Washington, D.C. 20332

Dear Dr. Radoski:

This is the technical report on AFOSR-89-0048 covering the period 11/1/90-10/31/91. During this period we have applied for no patents.

For most of the period covered in this report I was on sabbatical at the Institute of Astronomy in Cambridge University(from September 1990 through August 1991). During that time my work primarily concerned theoretical aspects of grant, while Stebbins and Restaino focused on the observational aspects.

My work in Cambridge was focused on describing the activity cycle's clock as a torsional oscillator, and describing the origin of the 5 minute oscillations which are our seismic probe. The original motivation for considering a torsional oscillator comes from helioseismology, Goode and Dziembowski(1991, Nature 349, 223), from which we have learned that the Sun's rotation does not vary near the base of the convection zone but may vary deeper down. The full equations for the torsional oscillator have been developed and have been solved for certain situations. Currently, Gough and I are developing the equations to describe the driving of a torsional oscillator confined to the radiative interior. The other work concerns the nature of the driving of all-important 5 minute oscillations. In this we showed, contrary to general expectation, that the oscillation is driven by granular size explosive events, Goode, Gough and

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Kosovichev(1992, Ap.J., in press). Knowing this is critical in our efforts to learn the global organization of convection and its relation to the origin of activity. In addition to this, I gave the invited review on the Sun's internal magnetism at the NASA workshop on the OSL satellite. The meeting was held in Capri last May. Further, I spent time at St. Andrews University in Scotland working with people there about the driving and damping of oscillations.

In the observational work, Stebbins and Restaino have de-bugged our observing set-up which is designed to allow us to capture the whole disk. We now are able to collect data in a production mode. Further, the data reduction programs are in full operation. We have made videos of our data and clearly see the basic behavior of 5 minute oscillation described by Goode, Gough and Kosovichev. We are now making global maps of the flux so we can look for the global organization of convection to see if giant cells exist.

Dr. Restaino is still in residence at the Sacramento Peak Observatory.

Sincerely,

Philip Goode

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